

WHAT IS CLAIMED IS:

1. A method of screening a plurality of drug candidate compounds against a target ion channel comprising:
 - expressing said target ion channel in a population of host cells;
 - placing a plurality of said host cells into each of a plurality of sample wells;
 - adding a candidate drug compound to at least one of said plurality of sample wells; and
 - modulating the transmembrane potential of host cells in said plurality of sample wells with a repetitive application of electric fields so as to set said transmembrane potential to a level corresponding to a pre-selected voltage dependent state of said target ion channel.
2. The method of Claim 1, additionally comprising selecting a host cell line having a normal resting transmembrane potential corresponding to a second pre-selected voltage dependent state of said target ion channel.
3. The method of Claim 1, wherein said electric fields are biphasic.
4. The method of Claim 1, wherein electric fields cause an ion channel of interest to cycle between different voltage dependent states.
5. The method of Claim 1, wherein said electric fields cause an ion channel of interest to open.
6. The method of Claim 1, wherein said electric fields cause an ion channel of interest to be released from inactivation.
7. The method of Claim 1, wherein said one or more cells comprise a voltage sensor selected from the group consisting of a FRET based voltage sensor, an

electrochromic transmembrane potential dye, a transmembrane potential redistribution dye, an ion sensitive fluorescent or luminescent molecule and a radioactive ion.